ASED http://e-ASED.org
Animal Systematics, Evolution and Diversity

Anim. Syst. Evol. Divers. Vol. 33, No. 3: 145-161, July 2017
https://doi.org/10.5635/ASED.2017.33.3.015

Review article

Review of the Genera *Scambus* and *Tromatobia* (Hymenoptera: Ichneumonidae: Pimplinae) from South Korea

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ABSTRACT

We reviewed eight South Korean species of the genera *Scambus* Hartig, 1838 and *Tromatobia* Förster, 1869. Among them, the Genus *Scambus* Hartig, 1838 is a moderately large group that includes 152 species worldwide. The South Korean genus *Scambus* Hartig, 1838 only includes one species, *Scambus calobatus* (Gravenhorst, 1829). The *Tromatobia* Förster, 1869 group is a relatively small genus, including 33 worldwide species. This group is recorded for the first time from South Korea. Also, we report seven newly recorded species: *Scambus nigricans* (Thomson, 1877), *Scambus vesicarius* (Ratzeburg, 1844), *Tromatobia flavistellata* Uchida and Momoi, 1957, *Tromatobia nipponica* Uchida, 1928, *Tromatobia ornata* (Gravenhorst, 1829), *Tromatobia ovivora* (Boheman, 1821), and *Tromatobia variabilis* (Holmgren, 1856). A key to South Korean species of the genera *Scambus* Hartig, 1838 and *Tromatobia* Förster, 1869, diagnoses and illustrations are provided.

Keywords: Eastern Palaearctic, *Scambus*, *Tromatobia*, Ephialtini, taxonomy

INTRODUCTION

The tribe Ephialtini of the subfamily Pimplinae is the largest group of the subfamily, currently including 963 species in 59 genera worldwide. Among them, the genus *Scambus* Hartig, 1838 is a moderately large group that includes 152 species worldwide, 26 of which inhabit the Eastern Palaearctic region: nine, 15 and 12 species have been recorded from China, Russia and Japan, respectively (Yu et al., 2016). A taxonomic study of South Korean *Scambus* Hartig, 1838 was initiated by Uchida (1928), who reported one species, *Scambus calobatus* (Gravenhorst, 1829). For the next 90 years, the South Korean genus *Scambus* Hartig, 1838 received very little attention, and the existing South Korean genus *Scambus* Hartig, 1838 only includes one species. Species of this genus are idiobiont, koinobiont, endoparasitoids, ectoparasitoids of Lepidoptera species (Shaw, 2006). However, some are parasitoids of larvae and pupae of Coleoptera and Hymenoptera (Torka, 1918; Kopelke, 1994). Oviposition occurs in the larvae, pupae and galls of the hosts (Liston, 1982; Kopelke, 2003). The *Tromatobia* Förster, 1869 group is a relatively small genus, including 33 worldwide species. Nine species have been recorded from Eastern Palaearctic region: three, six and four from China, Japan, and Russia, respectively. The South Korean *Tromatobia* Förster, 1869 group is recorded for the first time. Most species of this group are endoparasitoids of Lepidopteran eggs (Rollard, 1985; Kusigemati, 1988). Also, other species are parasitoids of Coleoptera and Hymenoptera (McPheron, 1985; De Dalla Torre, 1902). Oviposition occurs in the egg sac of the host (Nielsen, 1923). In this study, we report seven newly recorded species: *Scambus nigricans* (Thomson, 1877), *Scambus vesicarius* (Ratzeburg, 1844), *Tromatobia flavistellata* Uchida and Momoi, 1957, *Tromatobia nipponica* Uchida, 1928, *Tromatobia ornata* (Gravenhorst, 1829), *Tromatobia ovivora* (Boheman, 1821), and *Tromatobia variabilis* (Holmgren, 1856). Among them, *Tromatobia ovivora* (Boheman, 1821) also recorded for the first time from Greece. We provide diagnoses, illustrations and a key to the South Korean *Scambus* Hartig, 1838 and *Tromatobia* Förster, 1869 species.

MATERIALS AND METHODS

Materials used in this study were collected by sweeping

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eISSN 2234-8190

and Malaise trapping, after which they were deposited in the Animal Systematic Laboratory of Yeungnam University (YNU, Gyeongsan, South Korea). Morphological terminology follows mostly that of Townes (1969). Specimens were examined using an AxioCam MRc5 camera attached to a stereo microscope (Zeiss Stereo Discovery, V20; Carl Zeiss, Göttingen, Germany), processed using AxioVision SE64 software (Carl Zeiss), and optimized with a Delta imaging system (i-solution; IMT i-Solution Inc., Vancouver, Canada). Distributional data mainly follows that of Yu et al. (2016). Species diagnoses are based on South Korean specimens.

Abbreviations for collections are as follows: ANSP, Academy of Natural Sciences of Philadelphia, 19th and the Parkway, Philadelphia, Pennsylvania, 19103, USA; BMNH, The Natural History Museum, Department of Entomology, Cromwell Road, London, England, SW7 5BD, United Kingdom; HU, Hokkaido University, Faculty of Agriculture, Entomological Institute, Sapporo, Japan; IZB, Institut za zastitu bilja, Fakultete poljoprivrednih znanosti, Simunska 25, 41000 Zagreb, Croatia; IZU, Instytut Zoologiczny Uniwersytetu, Sienkiewicza 21, Wroclaw, Poland (Gravenhorst collection); MNCN, Departamento Entomologia, Museo Nacional de Ciencias Naturales, J. Gutierrez Abascal 2, E-28006 Madrid, Spain; MNHN, Muséum National d'Histoire Naturelle, Entomologie, 45 Rue de Buffon, Paris, 75005, France; MZ, Musée Zoologique, Place Riponne, CH-1000 Lausanne, Switzerland; NCM, Norwich Castle Museum, Norwich, United Kingdom; NHRS, Naturhistoriska Riksmuseet, Sektionen för Entomologi, S-104 05 Stockholm, Sweden; NM, Naturwissenschaftliche Sammlungen der Stadt Krefeld, Brempter Hof, D-47829 Krefeld-Uerdingen, Germany; NMW, Naturhistorisches Museum, Burgring 7, A-1014 Wien, Austria; SEMC, Snow Entomology Museum, University of Kansas, Lawrence, Kansas, 66045, USA; SMFD, Natur-Museum Senckenberg, Senckenberganlage 25, D-60325 Frankfurt, Germany; TMA, Termeszettudomanyi Muzeum Allattara, Barossa-Utea 13, Budapest H-1088, Hungary; UL, Universite Laval, Department de Biologie, Faculte des Sciences, Ste Foy, Quebec, G1K 7P4, Canada; USNM, United States National Museum of Natural History, Smithsonian Institute, Washington, D.C., 20560, USA; UU, Uppsala Universitet, Zoologiska Institutionen, Entomologiska Avdelningen, Villavägen 9, S-75236 Uppsala, Sweden (Thunberg collection.); ZM, Zoologiska Institutionen, Helgonavägen 3, S-223 62 Lund, Sweden; ZMHU, Zoologisches Museum (Museum für Naturkunde), Humboldt Universität, Invalidenstrasse 43, D-101115 Berlin, Germany; ZSM, Zoologisches Staatsammlung, Münchhausenstrasse 21, D-81247 München, Germany.

Abbreviations of Korean provinces and indices used in the paper as follows: CB, Chungcheongbuk-do; GB, Gyeongsangbuk-do; GG, Gyeonggi-do; GN, Gyeongsangnam-do; GW, Gangwon-do; JB, Jeollabuk-do; JJ, Jeju-do; TD, type depository; TL, type locality; TS, type species.

SYSTEMATIC ACCOUNTS

Order Hymenoptera Linnaeus, 1758
Family Ichneumonidae Latreille, 1802
Subfamily Pimplinae Wesmael, 1845
Tribe Ephialtini Hellén, 1915

[1*]Genus *Scambus* Hartig, 1838

Scambus Hartig, 1838: 246. TS: *Pimpla sagax* Hartig.
Epiurus Förster, 1869: 164. TS: *Pimpla calobata* Gravenhorst.
Tromera Förster, 1869: 164. TS: *Pimpla pomorum* Ratzeburg.
Troctocerus Woldstedt, 1877: 687–705. TS: *Troctocerus elegans* Woldstedt.
Ateleophadnus Cameron, 1905: 127. TS: *Ateleophadnus bicarinata* Cameron.
Pseudopoemenia Kiss, 1924: 91. TS: *Pseudopoemenia annulata* Kiss.
Erythroscambus Walley, 1960: 76. TS: *Pimpla hirticauda* Provancher.
Lissoscambus Walley, 1960: 25. TS: *Scambus* (*Lissoscambus*) *arizonensis* Walley.

Diagnosis. Propodeum quite short, lateromedian longitudinal carina apically and broadly separated. 1st tergite not slender, length of 1st tergite usually not more than 1.5 times as long as the width of one. 2nd tergite without oblique furrow. Clypeus and face of both female and male black or monochromatic.

Key to species of the genus *Scambus* Hartig, 1838 from South Korea

1. Female. ····· 2
− Male. ····· 4
2. Ovipositor significantly and laterally compressed. 2nd hind tarsomere approximately as long as the 5th one. Hind tibia mostly monochromatic and reddish (Fig. 1A, C). ····· *S. nigricans* (Thomson, 1877)
− Ovipositor slightly compressed. 2nd hind tarsomere shorter than the 5th one. Hind tibia usually with dark marks on sub basal and apical area (Fig. 2A, C). ····· 3

Korean name: [1*]굽은다리납작맵시벌속(신칭)

3. Hind tibia reddish, with marks (Fig. 2A, C). ····· ····· *S. vesicarius* (Ratzeburg, 1844)
− Hind tibia almost whitish or yellowish, with dark mark on basal and apical area. ··· *S. calobatus* (Gravenhorst, 1829)
4. Ventral area of fore femur without a notch or with an indistinct notch (Fig. 2B). ·· *S. vesicarius* (Ratzeburg, 1844)
− Ventral area of fore femur with distinct notch. ····· 5
5. Fore femur with a notch on ventral area (Fig. 1B). ····· ····· *S. nigricans* (Thomson, 1877)
− Fore femur with two notches on ventral area. ····· ····· *S. calobatus* (Gravenhorst, 1829)

[1]**Scambus nigricans* (Thomson, 1877) (Fig. 1)

Pimpla nigricans Thomson, 1877: 754. Lectotype: ♀; TL: Sweden; TD: ZM.
Pimpla similis Bridgman, 1884: 433. Lectotype: ♀; TL: United Kingdom; TD: NCM.
Pimpla cincticarpus Kriechbaumer, 1894b: 48. Type: ♀; TL: Switzerland; TD: lost.
Pimpla fulva Szépligeti, 1898: 121. Type: ♀; TL: Hungary; TD: lost.
Pimpla lucens Szepligeti, 1898: 121. Lectotype: ♂: TL: Hungary; TD: TMA.
Pimpla interruptecallosa Strobl, 1902: 3. Type: ♀; TL: Austria; TD: NMW.
Pimpla affinis Habermehl, 1903: 219. Type: ♀; TL: Germany; TD: unknown.
Pimpla kriechbaumeri Habermehl, 1903: 220. Lectotype: ♀; TL: Germany; TD: SMFD.
Pimpla robusta Morley, 1908: 65. Lectotype: ♀; TL: United Kingdom; TD: BMNH.
Pimpla obscuripes Hensch, 1929: 129. Type: ♂; TL: Yugoslavia; TD: IZB.
Pimpla singularis Hensch, 1929: 130. Type: ♂; TL: Yugoslavia; TD: IZB.
Scambus sparsator Aubert, 1965: 65. Type: ♀; TL: Yugoslavia; TD: MZ.

Diagnosis. Body black, with yellowish brown to reddish black marks on head, mesosoma and legs. Flagellum brown, except ventral area of scape, pedicel and 1st−3rd flagellomeres. Mesoscutum polished and densely punctate, with dense hairs; notauli distinct, extending to basal area (Fig. 1D). Propodeum slightly polished, distinctly and densely punctate, with dense hairs; dorso-median, basal and apical area relatively sparsely punctate; areola absent; propodeal spiracle sub-circle shaped; costula absent; lateromedian longitudinal carina present, extending to apical area. Hind leg reddish brown, except apical area of trochantellus brown; apical area of tarsal claw reddish black (Fig. 1A, C). Hind wing with a basal hamulus and 11 distal hamuli; vein between intercubitella and subcostella slightly longer than intercubitella; nervellus intercepted by discoidella at mid area (Fig. 1E).

Material examined. South Korea: 1♂, Daegu: Dalseong-gun, Mt. Palgongsan, 21 Jul 1996, Ryu SM; 1♂, Dong-gu, Sinmu-dong, San 7, (Site-38), (M.T.), 36°00′5.18″N, 128°40′54.71″E, 8 Apr−14 May 2014, Lee JW; GB: 1♂, Gyeongsan-si, Dae-dong, Yeungnam University, Onsil yeop, 35°58′N, 128°47′E, 6−20 May 2013, Lee JW; 1♂, ditto, 19 Apr 1991, Han JG; 1♂, ditto, 26 Aug 1988, Suh GI; 1♀, ditto, 23 Oct 1990, Ch DK; 1♂, Chilgok-gun, Dongmyeong-myeon, Hakmyeong-ri, San 25, (Site-23), 19 Oct 2014, Lee JW; GW: 1♂, Chuncheon-si, Balsan-2ri, Achim mot, 25 Jul 1998, Park HC; 1♂, Mt. Cheongoksan, 16 Aug 1997, Ryu SM; 1♂, Wonju-si, Heungeop-myeon, Maeji-ri, Yeonsei University, (Ungdeongi), 37°16′54.49″N, 127°53′54.54″E, 21 Apr−7 May 2015, Han HY; Germany: 1♂, Göttingen, 17 Aug 1947; 1♀, ditto, 29 May 1946.

Distribution. South Korea (new record), Algeria, Europe, Iran, Kazakhstan, Mongolia, Turkey, Uzbekistan.

Region. Palaearctic.

Remarks. Unlike other species of this genus, hind tibia of *S. nigricans* (Thomson, 1877) is entirely reddish without marks on female. Male of this species is similar to male of *S. calobatus* (Gravenhorst, 1829). But, fore femur of this species has only one notch on ventral area.

[2]**Scambus vesicarius* (Ratzeburg, 1844) (Fig. 2)

Pimpla vesicaria Ratzeburg, 1844: 115. Type: unknown; TL: unknown; TD: lost.
Pimpla cryptocampi Boie, 1857: 192. Type: unknown; TL: Germany; TD: unknown.
Pimpla euurae Ashmead, 1890: 447. Lectotype: ♀; TL: USA-California; TD: USNM.
Pimpla gallicola Morley, 1908: 1. Lectotype: ♀; TL: United Kingdom; TD: BMNH.
Pimpla calobata ruficoxis Ulbricht, 1909: 18. Type: unknown; TL: unknown; TD: unknown.
Pimpla vrevicornis rhenana Ulbricht, 1910: 8. Type: unknown; TL: Germany; TD: NM.
Pimpla salicicola Hensch, 1929: 130. Lectotype: ♂; TL: Yugoslavia; TD: IZB.

Diagnosis. Body black, with yellowish brown to reddish black area on head, mesosoma and legs. Flagellum dark brown, except scape black; ventral area of pedicel, outer lateral side area of 1st−2nd flagellomeres. Mesoscutum slight-

Korean name: [1]*붉은굽은다리납작맵시벌(신칭), [2]*무늬굽은다리납작맵시벌(신칭)

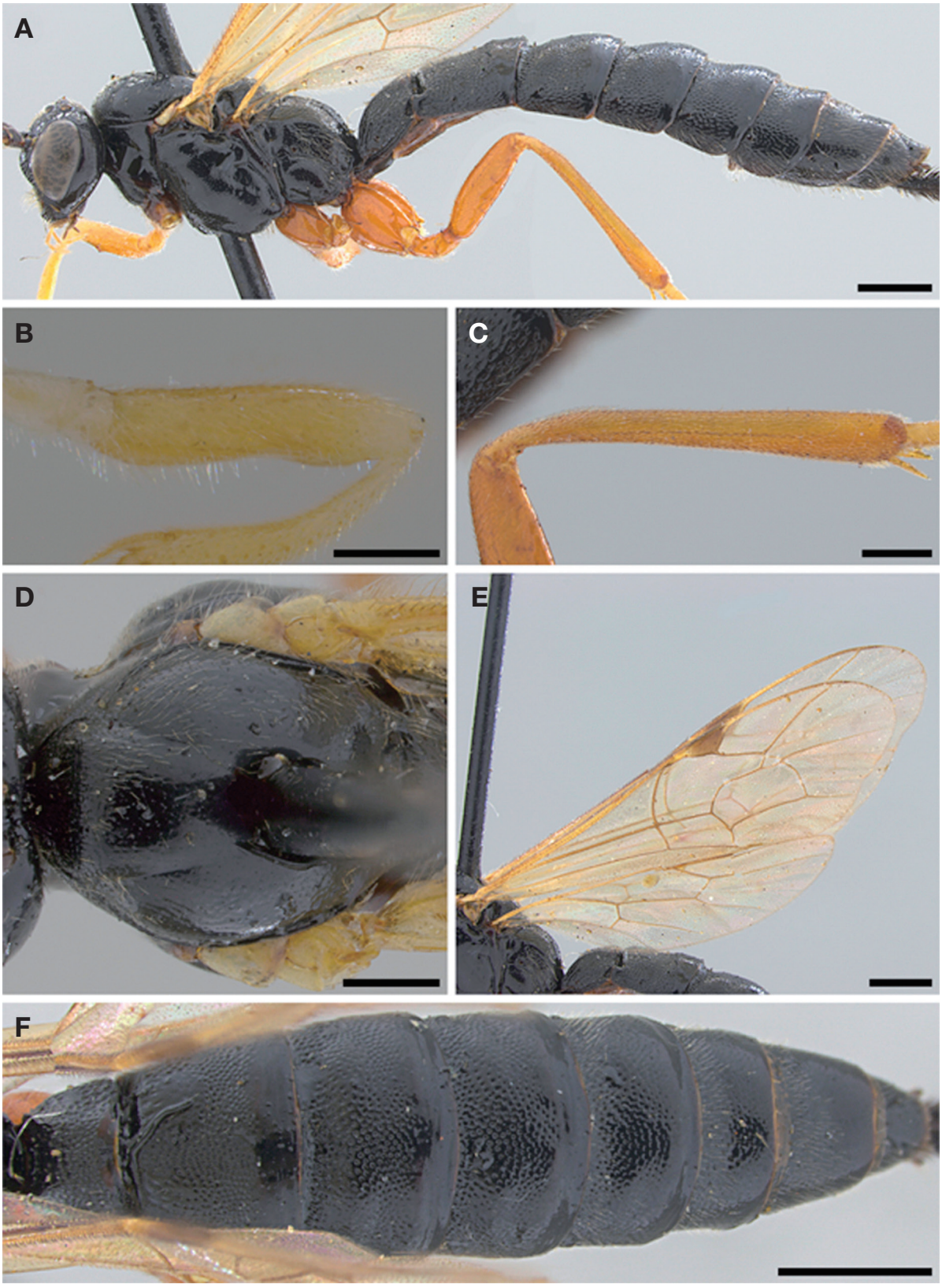

Fig. 1. A–F, *Scambus nigricans* (Thomson, 1877), female. A, Habitus in lateral view; B, Fore femur of male in lateral view; C, Hind tibia in lateral view; D, Mesoscutum in dorsal view; E, Wings; F, Entire tergites in dorsal view. Scale bars: A–F = 0.5 mm.

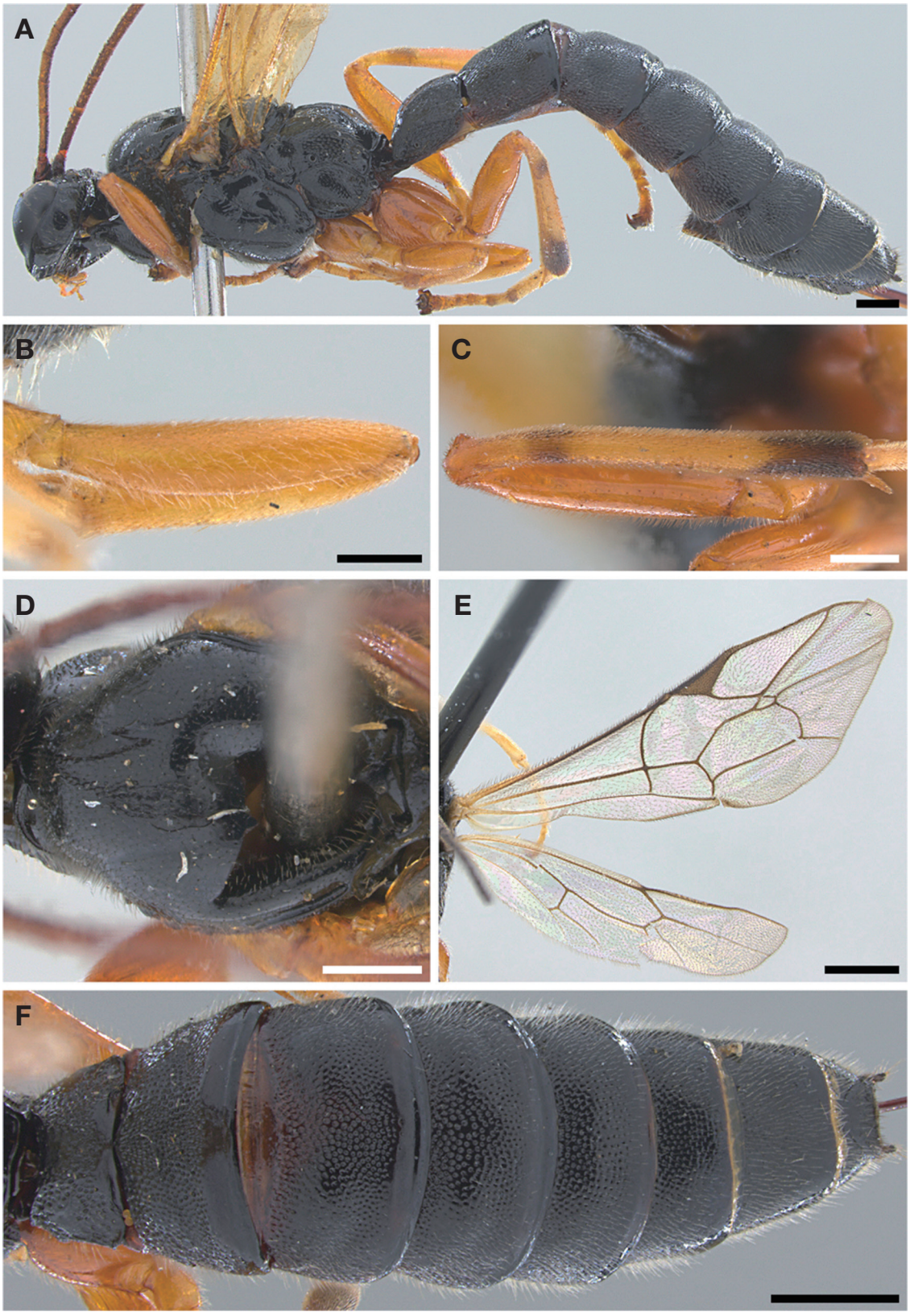

Fig. 2. A–F, *Scambus vesicarius* (Ratzeburg, 1844), female. A, Habitus in lateral view; B, Fore femur of male in lateral view; C, Hind tibia in dorsal view; D, Mesoscutum in dorsal view; E, Wings; F, Entire tergites in dorsal view. Scale bars: A–F = 0.5 mm.

ly polished, indistinctly and densely punctate, with dense hairs; notauli distinct, extending to basal area (Fig. 2D). Propodeum slightly polished, distinctly and densely punctate, with dense hairs; dorso-median area between lateromedian longitudinal carinae, basal and apical area relatively sparsely punctate; areola absent; propodeal spiracle circle shaped; costula absent; lateromedian longitudinal carina indistinctly present, extending to mid area. Hind leg whitish brown, except coxa and basal to sub apical area of femur reddish brown; sub basal and apical area of tibia, apical area of 1st−3rd tarsomeres dark brown; basal area of tarsal claw brown; apical area of tarsal claw reddish black (Fig. 2A, C). Hind wing with a basal hamulus and five distal hamuli; vein between intercubitella and subcostella slightly longer than intercubitella; nervellus intercepted by discoidella at lower area (Fig. 2E).

Material examined. South Korea: CB: 1♂, Cheongwon-gun, Miwon-myeon, Mt. Midongsan arboretum, (M.T.), 36°37′35.8″N, 127°39′52.6″E, 29 Mar−29 Apr 2013, Jeong YS; GB: 1♂, Gyeongsan-si, Yeungnam University, 27 Apr 1991, K ES; GG: 1♀, Gapyeong-gun, Mt. Myeongjisan, 23 Sep 1989, Jeong JH; 1♂, Gwangcheon-ri, 23 Apr 1984, Lee JW; JB: 1♀, Muju-gun, Seolcheon-myeon, Jangdeok-ri, Gucheondong, 21 May 1983, Lee JW; Bulgaria: 1♀, Sofia, Simeonovo, alt. 790 m, 22 May 1998, Kolarov J.

Distribution. South Korea (new record), Canada, Europe, Iran, Japan, Mongolia, Turkey, USA.

Region. Holarctic.

Remarks. This species is similar to *S. calobatus* (Gravenhorst, 1829). But, hind tibia of this species is reddish on female, with black marks. Also, fore femur of this species has not notch or has indistinct notch on male.

[1]*Scambus calobatus* (Gravenhorst, 1829)

Pimpla calobata Gravenhorst, 1829: 176. Type: ♀; TL: Poland; TD: IZU.

Pimpla (*Scambus*) *planata* Hartig, 1838: 267. Type: ♀; TL: Germany; TD: ZSM (lost).

Pimpla ghilianii Spinola, 1843: 119. Type: ♀; TL: Spain; TD: lost.

Pimpla nucum Ratzeburg, 1844: 115. Type: ♀; TL: Germany; TD: lost.

Pimpla longiventris Ratzeburg, 1848: 94. Type: ♂; TL: Germany; TD: lost.

Pimpla ventricosa Tschek, 1871: 40. Lectotype: ♀; TL: Austria; TD: NMW.

Pimpla gallicola Giraud, 1872: 503. Lectotype: ♂; TL: unknown; TD: MNHN.

Pimpla stramentaria Kriechbaumer, 1890: 483. Holotype: ♀; TL: Austria; TD: NMW.

Pimpla zonata Habermehl, 1903: 219. Lectotype: ♀; TL: Germany; TD: SMFD.

Pimpla calobataria Kokujev, 1913: 167. Type: ♀; TL: Russia-Ul'yanovsk Oblast; TD: unknown.

Pimpla nigrodorsalis Ulbricht, 1916: 6. Type: ♀; TL: Germany; TD: unknown.

Epiurus nucum nigricoxis Habermehl, 1918: 118. Type: ♀; TL: France; TD: unknown.

Epiurus glycinivorellae Kuwayama, 1928: 276. Lectotype: ♀; TL: Japan; TD: HU.

Epiurus glycinivorellae Uchida, 1928: 60. Lectotype: ♀; TL: Japan; TD: HU.

Diagnosis. Body black, with whitish brown to reddish black marks on head, mesosoma and legs. Flagellum brown, except entire scape, dorsal area of pedicel and basal ten flagellomeres black. Mesoscutum weakly polished and densely punctate, with dense hairs; notauli distinct, extending to mid area. Propodeum slightly polished, distinctly and densely punctate, with dense hairs; dorso-median, apical area sparsely punctate; areola absent; propodeal spiracle circle shaped; costula absent; lateromedian longitudinal carina present, extending to mid area. Hind leg reddish brown, except entire trochanter and trochantellus yellowish brown; basal and mid area of tibia, basal to subapical area of 1st−3rd tarsomeres whitish brown; subbasal and apical area of tibia, apical area of 1st−3rd tarsomeres black; entire 4th and 5th tarsomeres and basal area of tarsal claw brown; apical area of tarsal claw reddish black. Hind wing with a basal hamulus and seven distal hamuli; vein between intercubitella and subcostella longer than intercubitella; nervellus intercepted by discoidella at mid area.

Material examined. South Korea: Data describing South Korean specimens used for morphological study are summarized in Tables 1 and 2 to describe seasonal and regional appearance progress of species (including 114♀♀ specimens);

Table 1. Material examined of *Scambus calobatus* (Gravenhorst, 1829) (location)

	GG	GW	CB	GB	GN	JB	JJ	Seoul	Incheon	Daejeon	Daegu	Ulsan	Total
S. calobatus (Gravenhorst, 1829)	21	20	4	48	4	3	2	5	1	4	1	1	114

Korean name: [1]*두홈굽은다리납작맵시벌(개칭)

Table 2. Material examined of *Scambus calobatus* (Gravenhorst, 1829) (date of collection)

	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Total
S. calobatus (Gravenhorst, 1829)	6	44	17	8	6	19	13	1	114

China: 1♀, Jilin, Erdaoabaihe, Mt. Naedusan, 8 Aug 1988, Lee JW; Mongolia: 1♀, Mongolia National University research forest, Site-4, Tov. Üdeligiin Dugan, 48°26′22.68″N, 106°84′89.16″E, 4 Jul 2013, Choi JK; Russia: 1♀, Sakhalin, Kholmsk, Nar yan-Mar, 46°54′41.1″N, 142°17′19.7″E, 15 Jul 2008, Lee JW.

Distribution. Canada, China, Europe, Iran, Japan, Mongolia, Morocco, South Korea, Tunisia, Turkey, USA.

Region. Holarctic.

Remarks. Female of this species is similar to *S. vesicarius* (Ratzeburg, 1844). But, hind tibia of this species is whitish or yellowish with black marks. Unlike male of *S. nigricans* (Thomson, 1877), fore femur of this species has two notches on ventral area.

[1*]Genus *Tromatobia* Förster, 1869

Tromatobia Förster, 1869: 164. TS: *Pimpla variabilis* Holmgren.

Austropimpla Brèthes, 1913: 40. TS: *Austropimpla huebrichi* Brèthes.

Diagnosis. Antenna of male without tyloids. Occipital carina always distinct, slightly curved upwards. Nervellus of hind wing intercepted above its mid. Areolet of fore wing usually present. Ovipositor in lateral view straight and tapered at apex; basal tooth of ovipositor not enlarged.

Key to species of the genus *Tromatobia* Förster, 1869 from South Korea

1. Face and mesosoma entirely black (Figs. 3, 7A). ····· 2
− Inner orbit and edge area of face with yellow marks. Mesosoma with yellowish brown to reddish brown marks (Fig. 4A–C). ····· 3
2. Entire tergites black to reddish black (Fig. 7A, F). ····· ····· *T. variabilis* (Holmgren, 1856)
− Basal to sub apical area of 2nd–5th tergites of female yellowish brown, except apical area black; 1st and 6th–8th tergites entirely black (Fig. 3A). ····· ····· *T. flavistellata* Uchida and Momoi, 1957
3. Occipital carina not elevated, sometimes concave. ····· ····· *T. ovivora* (Boheman, 1821)
− Occipital carina distinctly elevated on mid area ····· 4
4. Basal to subapical area of 2nd–5th tergites with reddish black area (Fig. 5A, F). ····· *T. ornata* (Gravenhorst, 1829)
− Entire tergites black (Fig. 4A, F). ····· ····· *T. nipponica* Uchida, 1928

[2*]***Tromatobia flavistellata* Uchida and Momoi, 1957 (Fig. 3)**

Tromatobia flavistellata Uchida and Momoi, 1957: 8. Type: ♀; TL: Japan; TD: HU.

Diagnosis. Body black, with yellowish brown to reddish black marks on head, mesosoma, metasoma and legs. Flagellum brown, except ventral apical area of scape, ventral area of pedicel, 1st–9th flagellomeres. Pronotum slightly polished and sparsely punctate, with sparse hairs; mid and lower area smooth; epomia distinct (Fig. 3C). Mesopleuron slightly polished, relatively and densely punctate, with hairs; median basal area smooth; mesopleural suture indistinct and dense; speculum polished and sparsely punctate, with sparse hairs; mesopleural pit present; epicnemial carina present; postpectal carina absent; sternaulus indistinctly present (Fig. 3C). Hind leg yellowish brown, except coxa, femur, sub basal and sub apical area of tibia, basal area of 5th tarsomere reddish brown; apical area of tibia, 1st–2nd tarsomeres dark brown; apical area of 3rd and 5th tarsomeres, basal area of tarsal claw brown; basal to sub apical area of 1st–3rd tarsomeres and entire 4th tarsomere whitish brown; apical area of tarsal claw reddish black. Hind wing with a basal hamulus and seven distal hamuli; vein between intercubitella and subcostella slightly shorter than intercubitella; nervellus intercepted by discoidella at mid area (Fig. 3E).

Material examined. South Korea: GB: 1♀, Gyeongsan-si, Nammae-ri, 7 Jul 1986, Cha JY; 1♀1♂, Gyeongsan-si, Yeungnam University, 6 May 1987, Cha JY; 2♀♀, ditto, 7 May 1987, Lee JW; GN: 1♀, Milyang-si, Mt. Cheonwangsan, 24 Sep 1987, Kim SJ.

Distribution. South Korea (new record), China, Japan.

Region. Eastern Palaearctic, Oriental.

Remarks. This species is similar to *T. variabilis* (Holmgren, 1856). But, basal to sub apical area of 2nd–5th tergites of this species are yellowish brown on female. Also, sub basal to apical area of 1st tergite and basal to sub apical area of 2nd–5th tergites of this species are yellowish brown on male.

Korean name: [1*]경포납작맵시벌속(신칭), [2*]황금경포납작맵시벌(신칭)

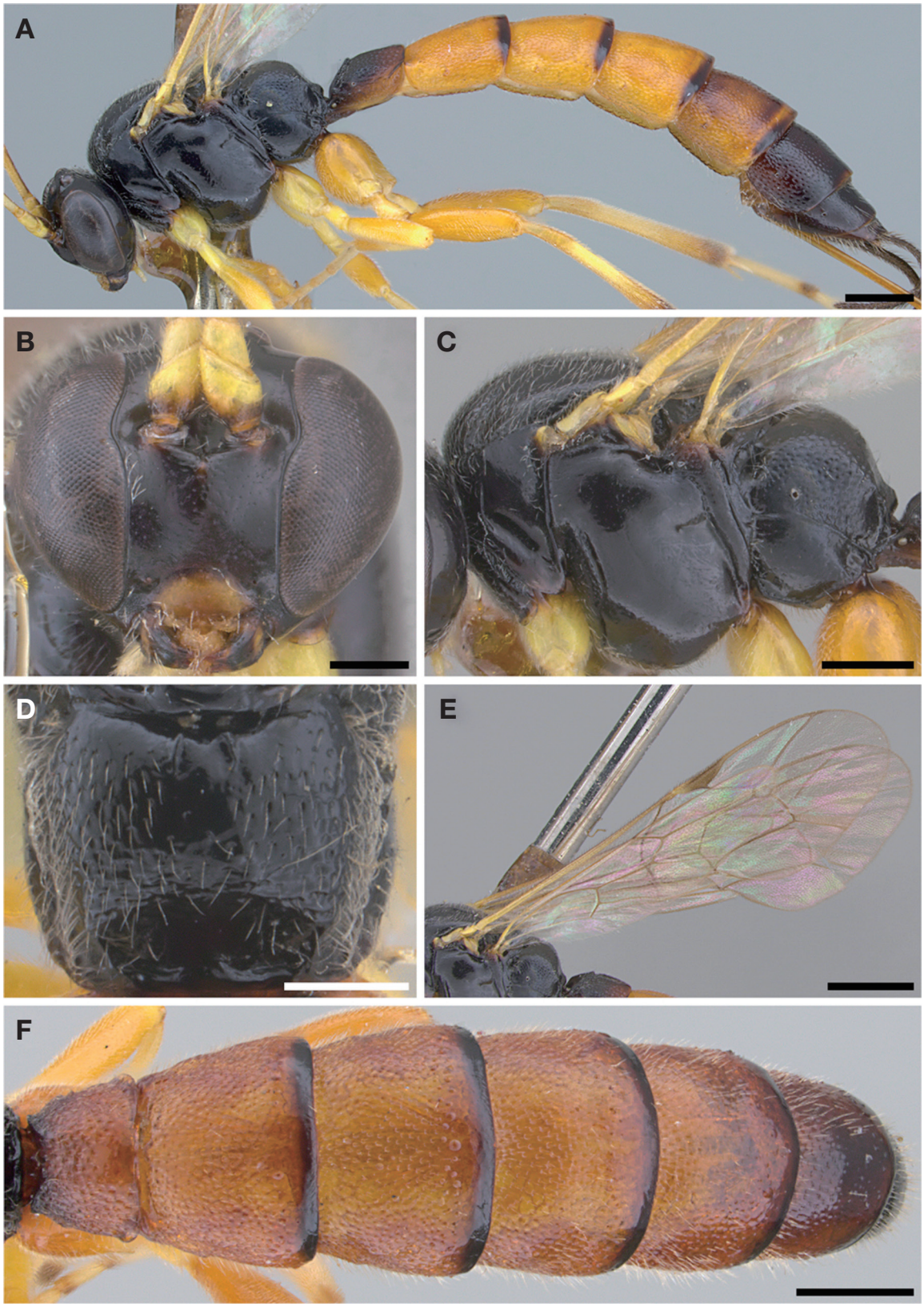

Fig. 3. A–F, *Tromatobia flavistellata* Uchida & Momoi, 1957, female. A, Habitus in lateral view; B, Head in frontal view; C, Mesosoma in lateral view; D, Propodeum in dorsal view; E, Wings; F, Entire tergites of male in dorsal view. Scale bars: A–F = 0.5 mm.

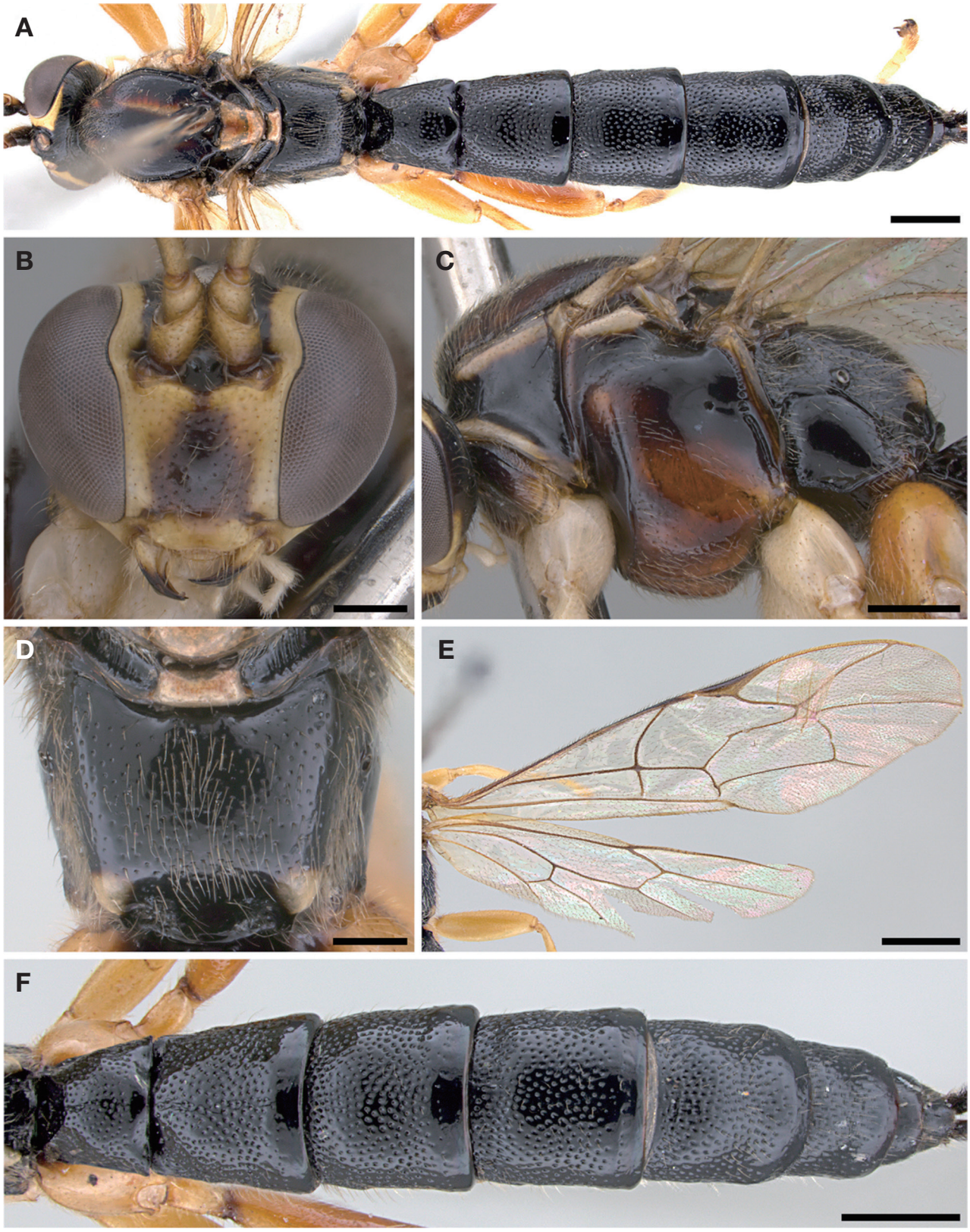

Fig. 4. A–F, *Tromatobia nipponica* Uchida, 1928, female. A, Habitus in dorsal view; B, Head in frontal view; C, Mesosoma in lateral view; D, Propodeum in dorsal view; E, Wings; F, Entire tergites in dorsal view. Scale bars: A–F = 0.5 mm.

[1]**Tromatobia nipponica* **Uchida, 1928 (Fig. 4)**

Tromatobia nipponica Uchida, 1928: 54. Type: ♀; TL: Japan; TD: HU.

Diagnosis. Body black, with yellowish brown to reddish black marks on head, mesosoma and legs. Flagellum brown, except dorsal area of scape, pedicel, dorsal area of 1st−2nd flagellomeres black; dorsal area of remain flagellomeres dark brown. Pronotum slightly polished and sparsely punctate, with sparse hairs; epomia distinct (Fig. 4C). Mesopleuron slightly polished, relatively and densely punctate, with dense hairs; mid basal area smooth; mesopleural suture indistinct and dense; speculum slightly polished and smooth, except upper area sparsely punctate; mesopleural pit present; epicnemial carina present; postpectal carina absent; sternaulus indistinctly present (Fig. 4C). Hind leg whitish brown, except ventral area of coxa, basal area of trochanter and lateral basal to sub apical area of femur reddish brown; basal area of femur, sub basal and apical area of tibia, apical area of 1st−2nd tarsomeres dark brown; apical area of 5th tarsomere and basal area of tarsal claw brown; apical area of tarsal claw black. Hind wing with a basal hamulus and six distal hamuli; vein between intercubitella and subcostella slightly longer than intercubitella; nervellus intercepted by discoidella at mid area (Fig. 4F).

Material examined. South Korea: CB: 1♂, Jecheon-si, Hansu-myeon, Songgye-2ri, (06), 36°52′40″N, 128°06′25″E, 26 May 2007, Park SJ; Daegu: 1♀, Dong-gu, Sinmu-dong, San7, (Site-48), (M.T.), 36°00′5,18″N, 128°40′54.71″E, 15 Jul−29 Aug 2014, Lee JW; GB: 1♀, Bonghwa-gun, Jaesan-myeon, Galsal-ri, Mt. Mirimsan, 4 May 1997, Ryu SM; 1♀, Cheongdo-gun, Unmun-myeon, Keungolgyegok, (U4), 35°38′24″N, 128°58′15″E, 9 Jun 2012, Lee JW; 1♀, ditto, Sariamjuchajang, (U3), (M.T.), 35°38′32″N, 128°57′50″E, 9−24 Jun 2012, Lee JW; 1♀, Uljin-gun, Onjenog-myeon, Mt. Baegamsan, 36°42′N, 129°17′E, 14 May−19 Jun 1999, Lee JW; GG: 1♀, Namyangju-si, Joan-myeon, Songchon-ri, Mt. Ungilsan, (M.T.), (alt. 134 m), 37°34′43.3″N, 127°18′37.5″E, 16−30 Jul 2009, Lim JO; GN: 1♀, Geochang-gun, Gabuk-myeon, Gwaneum village, 29 Jun 2016, Lee JW; 1♀, Hapcheon-gun, Bongsan-myeon, Apgok-ri, San 150-3, (Masang), 4 Jun−10 Jul 2014, Lee JW; 1♀, Hapcheon-gun, Gaya-myeon, Chiin-ri, Gwaneumgol wetland, 5 Jul 2016, Lee JW; GW: 2♀, Hongcheon-gun, Gachilbong, 1−23 Jun 1994, Kim HN; Unknown: 1♀, Mt. Cheongoksan, 16 Aug 1997, Ryu SM.

Distribution. South Korea (new record), Japan.

Region. Eastern Palaearctic.

Remarks. This species is similar to *T. ornata* (Gravenhorst, 1829). But, entire tergites of this species are generally black.

[2]**Tromatobia ornata* **(Gravenhorst, 1829) (Fig. 5)**

Pimpla ornata Gravenhorst, 1829: 158. Lectotype: ♀; TL: Poland; TD: IZU.

Polysphincta soror Ratzeburg, 1848: 1. Type: ♀; TL: Germany; TD: lost.

Tromatobia arachnicida Förster, 1888: 496. Lectotype: ♀; TL: France; TD: ZMHU.

Pimpla concors Kriechbaumer, 1890: 482. Lectotype: ♂; TL: Yugoslavia; TD: ZSM.

Pimpla semivaria Kriechbaumer, 1894a: 247. Type: ♀; TL: Spain-Islas Baleares; TD: MNCN.

Pimpla tricolor Kriechbaumer, 1894a: 248. Lectotype: ♂; TL: Spain-Islas Baleares; TD: ZSM.

Diagnosis. Body black, with yellowish brown to reddish black marks on head, mesosoma, metasoma and legs. Flagellum brown, except dorsal area of scape black; basal ventral area of scape, dorsal area of pedicel and entire flagellomeres dark brown; sub basal to apical ventral area of scape, ventral area of pedicel and 1st−2nd flagellomeres. Pronotum polished and smooth, except upper area densely punctate, with dense hairs; epomia distinct (Fig. 5C). Mesopleuron slightly polished, indistinctly and sparsely punctate, with sparse hairs; mesopleural suture indistinct and dense; speculum slightly polished and sparsely punctate, with sparse hairs, except lower area smooth; mesopleural pit present; epicnemial carina present; postpectal carina and sternaulus absent (Fig. 5C). Hind leg whitish brown, except basal and mid to ventral area of coxa, basal area of trochanter, basal to apical area of femur reddish brown; sub basal and apical area of tibia, apical area of 1st−2nd tarsomeres dark brown; sub basal to sub apical area of 1st−2nd tarsomeres, entire 5th tarsomeres and basal area of tarsal claw brown; apical area of trochantellus and tarsal claw reddish black. Hind wing with a basal hamulus and six distal hamuli; vein between intercubitella and subcostella approximately as long as intercubitella; nervellus intercepted by discoidella on upper area beyond mid area (Fig. 5D).

Material examined. South Korea: CB: 1♀, Danyang-gun, Yeongchun-myeon, Okdae-ri, 5 Aug 1994, Ryu SM; GN: 1♂, Milyang-si, Danjang-myeon, Gucheon-ri, Pyochungsa temple, 7 Jul 1986, Choi JM.

Distribution. South Korea (new record), Europe, Iran, Israel, Kazakhstan, Pakistan, Turkey.

Region. Eastern Palaearctic, Oriental, Western Palaearctic.

Remarks. This species is similar to *T. nipponica* Uchida, 1928. However, basal to sub apical area of 2nd−5th tergites

Korean name: [1]*일본경포납작맵시벌(신칭), [2]*장식경포납작맵시벌(신칭)

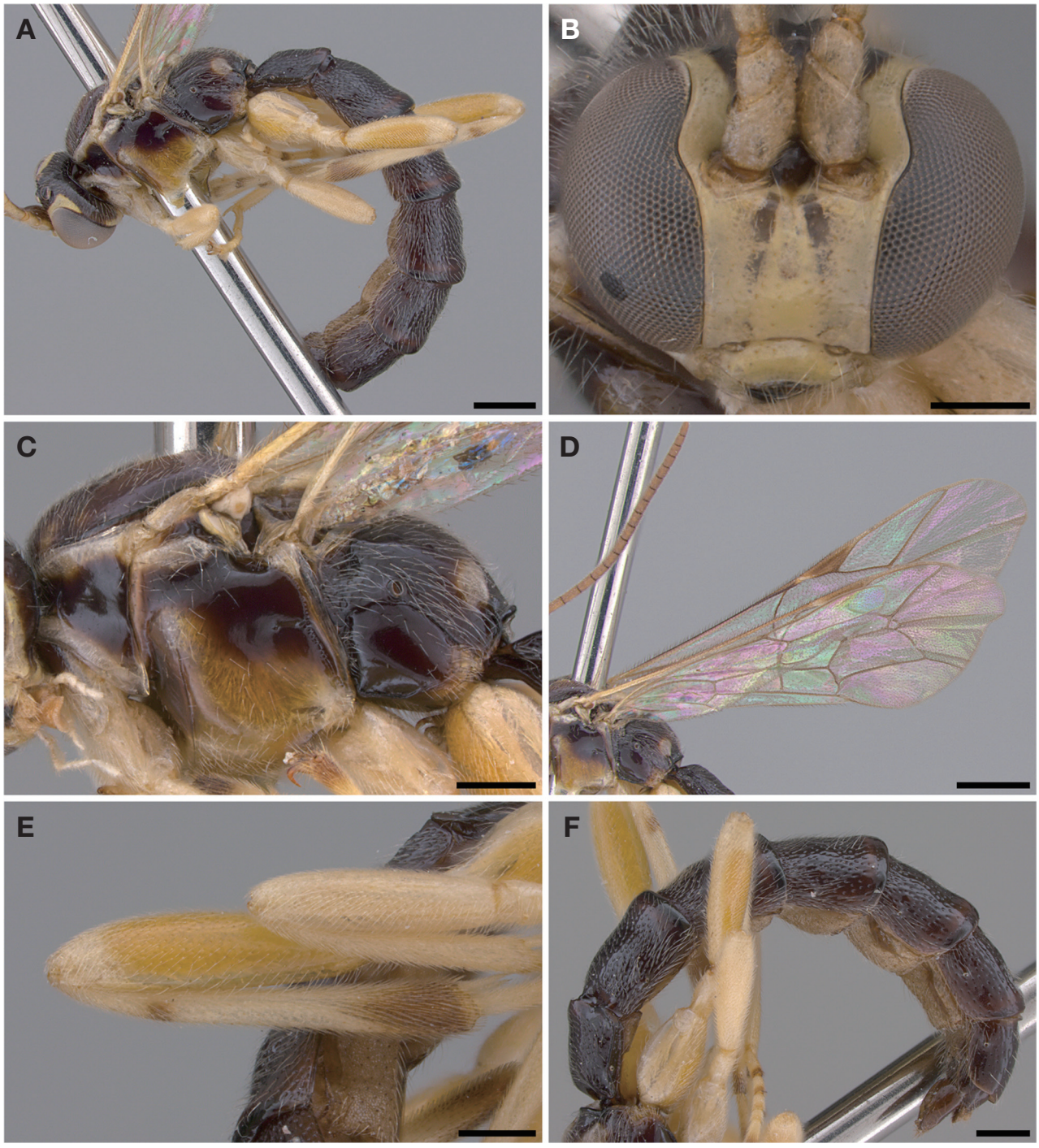

Fig. 5. A–F, *Tromatobia ornata* (Gravenhorst, 1829), male. A, Habitus in lateral view; B, Head in frontal view; C, Mesosoma in lateral view; D, Wings; E, Hind tibia in lateral view; F, Entire tergites in lateral view. Scale bars: A–F = 0.5 mm.

are reddish black on this species, with black apical marks.

[1]**Tromatobia ovivora* (Boheman, 1821) (Fig. 6)

Pimpla ovivora Boheman, 1821: 336. Lectotype: ♀; TL: Sweden; TD: NHRS.

Ichneumon armillatorius Thunberg, 1822: 281. Type: ♀;

Korean name: [1]*가두리경포납작맵시벌(신칭)

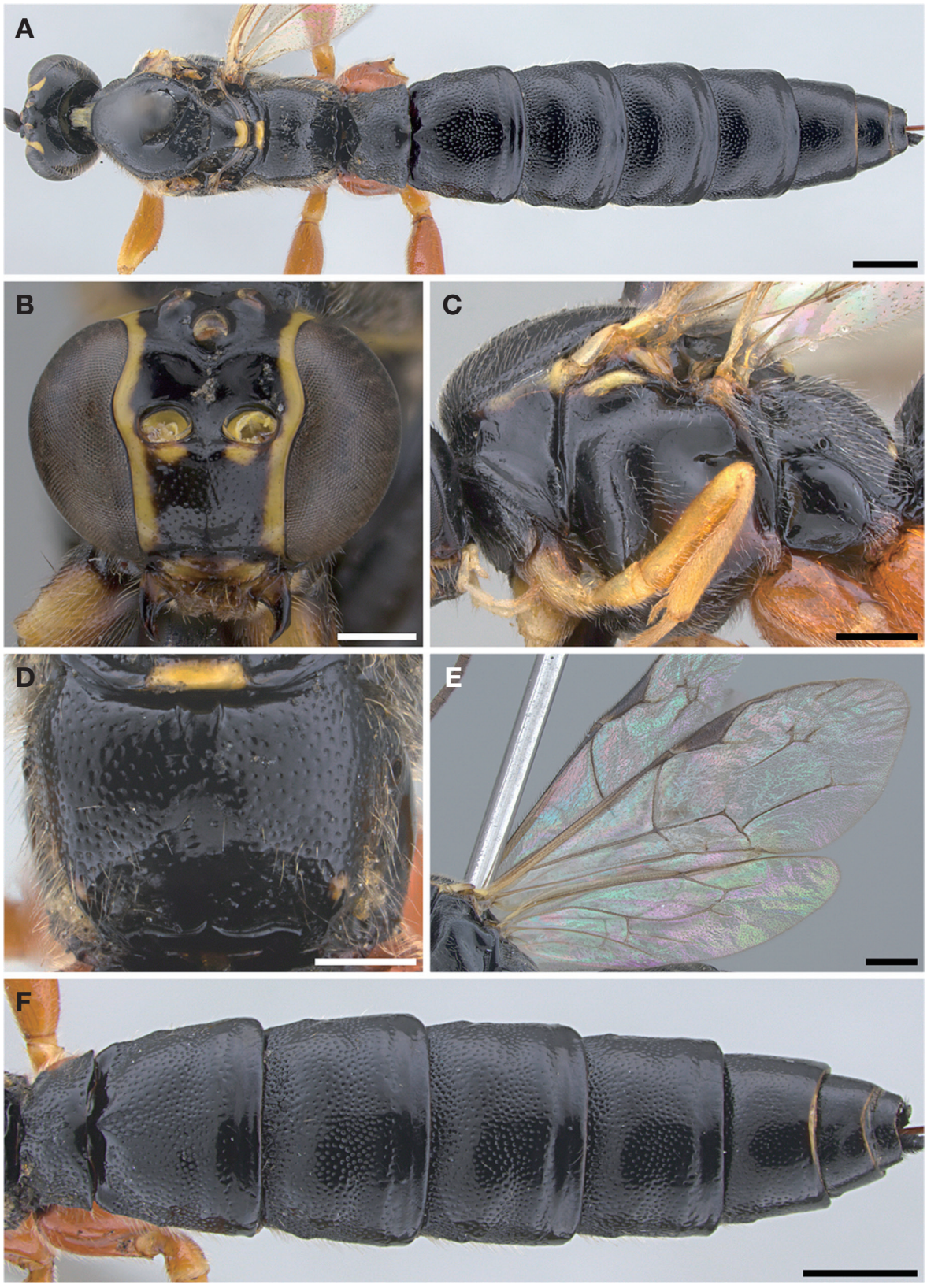

Fig. 6. A–F, *Tromatobia ovivora* (Boheman, 1821), female. A, Habitus in dorsal view; B, Head in frontal view; C, Mesosoma in lateral view; D, Propodeum in dorsal view; E, Wings of male; F, Entire tergites in dorsal view. Scale bars: A–F = 0.5 mm.

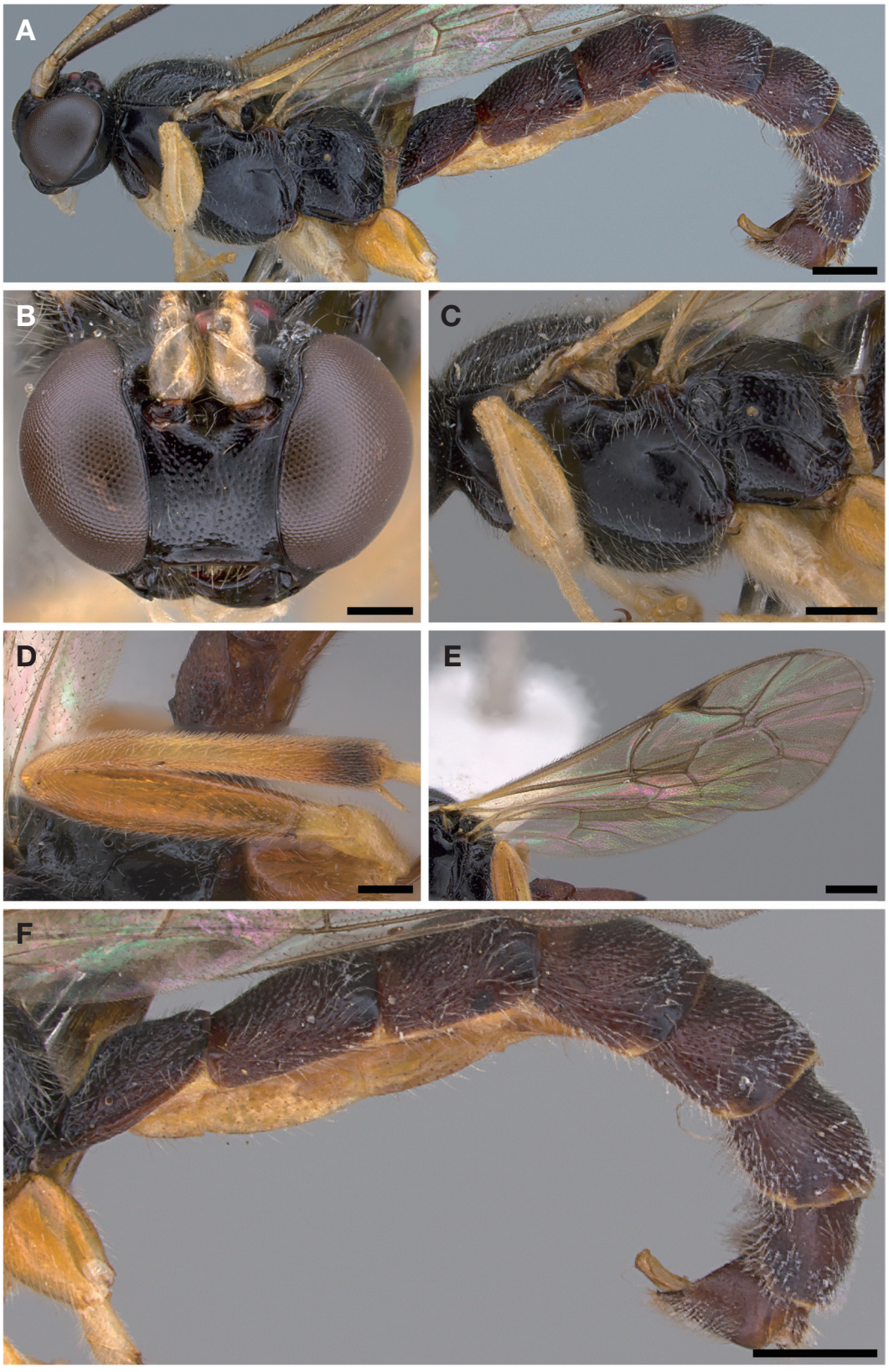

Fig. 7. A–F, *Tromatobia variabilis* (Holmgren, 1856), male. A, Habitus in lateral view; B, Head in frontal view; C, Mesosoma in lateral view; D, Hind tibia in dorsal view; E, Wings; F, Entire tergites in lateral view. Scale bars: A–F = 0.5 mm.

TL: unknown; TD: UU.
Ichneumon vexatorius Thunberg, 1822: 281. Type: ♀; TL: unknown; TD: UU.
Pimpla angens Gravenhorst, 1829: 162. Lectotype: ♂; TL: Finland; TD: IZU.
Pimpla scriptifrons Walsh, 1870: 148. Lectotype: ♀; TL: USA-Delaware; TD: ANSP.
Pimpla vidua Walsh, 1873: 65. Type: ♀; TL: unknown; TD: lost.
Pimpla paralleala Thomson, 1877: 732. Type: ♀; TL: Sweden; TD: lost.
Tromatobia contraria Förster, 1888: 496. Lectotype: ♀; TL: unknown; TD: ZMHU.
Tromatobia evacuans Förster, 1888: 497. Lectotype: ♀; TL: unknown; TD: ZMHU.
Pimpla rufipleura Bignell, 1889: 15. Lectotype: ♀; TL: United Kingdom; TD: BMNH.
Pimpla albipes Brischke, 1891: 50. Type: ♂; TL: Poland; TD: lost.
Pimpla defensator Davis, 1898: 349. Lectotype: ♀; TL: USA-Michigan; TD: ANSP.
Pimpla landerensis Viereck, 1906: 243. Holotype: ♀; TL: USA-Wyoming; TD: SEMC.
Pimpla angens obscurata Ulbricht, 1910: 6. Lectotype: unknown; TL: Germany; TD: NM.
Pimpla (*Iseropus*) *viduiformis* Viereck, 1912: 591. Type: ♂; TL: Palaearctic; TD: USNM.
Apechtis rugulosa Morley, 1914: 34. Type: ♀; TL: Canada-British Columbia; TD: BMNH.
Pimpla (*Tromatobia*) *angens simulans* Hensch, 1929: 127. Type: ♀; TL: Yugoslavia; TD: IZB.

Diagnosis. Body black, with whitish brown to reddish black marks on head, mesosoma and legs. Flagellum brown, except dorsal area of scape, pedicel, 1st−12th flagellomeres black. Pronotum polished and smooth, except upper basal area sparsely punctate, with sparse hairs; epomia distinct (Fig. 6C). Mesopleuron polished, relatively and densely punctate, with dense hairs; basal mid area sparsely punctate; mesopleural suture indistinct and dense; speculum polished and smooth, except upper area sparsely punctate, with sparse hairs; mesopleural pit present; epicnemial carina present; postpectal carina absent; sternaulus indistinctly present (Fig. 6C). Hind leg whitish brown, except coxa, trochanter, sub basal to sub apical area of femur reddish brown; basal and apical area of femur, sub basal and apical area of tibia, apical area of 1st−5th tarsomeres black; basal area of tarsal claw brown; apical area of tarsal claw reddish brown. Hind wing with a basal hamulus and seven distal hamuli; vein between intercubitella and subcostella longer than intercubitella; nervellus intercepted by discoidella on upper area beyond mid area (Fig. 6E).

Material examined. South Korea: Daejeon: 1♂, Dong-gu, Daejeon University, (M.T.), 13−28 Apr 2006; GB: 1♀, Mungyeong-si, Dongro-myeon, Jeokseong-ri, St. No.59, Beoljae-seotgol, Mt. Wolaksan National Park, 3 Jul 2006, (Site-103), Kim TH; GG: 1♀, Gapyeong-gun, Cheongpyeong-myeon, Daeseong-ri, 27 May 2000, Kim JM; Greece: 1♀, Olympus, Prionia, alt. 1,100 m, 26 Aug 1993, Kolarov J; 1♂, ditto, 26 Aug 1993, Kolarov J.

Distribution. South Korea (new record), Canada, Europe, Japan, Kazakhstan, Kyrgyzstan, Mexico, Mongolia, Turkey, USA.

Region. Eastern Palaearctic, Nearctic, Neotropical, Oceanic, Western Palaearctic.

Remarks. This species is similar to *T. ornata* (Gravenhorst, 1829) and *T. nipponica* Uchida, 1928. But, occipital carina of this species is not elevated, sometimes concave.

[1]**Tromatobia variabilis* (Holmgren, 1856)

Pimpla abdominalis Brullé, 1846: 56. Type: ♂; TL: Egypt; TD: MNHN.
Pimpla variabilis Holmgren, 1856: 88. Lectotype: ♀; TL: Sweden; TD: NHRS.
Pimpla rufovariata Cresson, 1870: 149. Lectotype: ♀; TL: USA-Pennsylvania; TD: ANSP.
Polysphincta cingulatus Provancher, 1875: 138. Type: ♀; TL: Canada-Quebec; TD: UL.
Pimpla epeirae Bignell, 1893: 1-37. Lectotype: ♀; TL: United Kingdom; TD: BMNH.
Pimpla hibernica Morley, 1908: 1-328. Lectotype: ♀; TL: United Kingdom; TD: BMNH.
Pimpla ruficoxa Kokujev, 1913: 167. Type: ♀; TL: Russia; TD: lost.
Pimpla (*Tromatobia*) *inornata* Ulbricht, 1926: 11. Type: ♀; TL: Germany; TD: NM.
Tromatobia sappporensis Uchida, 1928: 54. Lectotype: ♀; TL: Japan; TD: HU.

Diagnosis. Body black, with yellowish brown to reddish black marks on head, mesosoma, metasoma and legs. Flagellum yellowish brown, except basal area of scape black; dorsal area of pedicel and entire flagellomeres brown. Pronotum slightly polished and densely punctate, with dense hairs, except mid and lower area smooth; epomia distinct. Mesopleuron slightly polished, relatively and sparsely punctate, with hairs; mesopleural suture indistinct and dense; speculum slightly polished and sparsely punctate, with

Korean name: [1]*암적경포납작맵시벌(신칭)

sparse hairs, except lower area smooth; mesopleural pit present; epicnemial carina present; postpectal carina absent; sternaulus indistinctly present (Fig. 7C). Hind leg yellowish brown, except basal to sub apical area of coxa, entire femur and sub apical area of tibia reddish brown; basal and mid area of tibia, basal to sub apical area of 1st−5th tarsomeres whitish brown; apical area of tibia and 1st−2nd tarsomeres black; apical area of 3rd−5th tarsomeres, basal area of tarsal claw dark brown; apical area of tarsal claw reddish black. Hind wing with a basal hamulus and six distal hamuli; vein between intercubitella and subcostella as long as intercubitella; nervellus intercepted by discoidella on upper area beyond mid area (Fig. 7E).

Material examined. South Korea: GW: 1♀, Wonju-si, Munmak-eup, Huyong-ri, Seomgang river side, 11 May 2002, Choi DS, Lee HS, Lim MH; JJ: 1♂, Jeju-si, 8 Aug 1981, Park JS.

Distribution. South Korea (new record), Afghanistan, Armenia, Canada, Egypt, Europe, Japan, Kazakhstan, Mongolia, Turkey, USA.

Region. Holarctic.

Remarks. This species is similar to *T. flavistellata* Uchida and Momoi, 1957. But, tergites of this species are mainly reddish black.

ACKNOWLEDGMENTS

This work was supported by a grant from the National Institute of Biological Resources (NIBR), funded by the Ministry of Environment (MOE) of the Republic of Korea (NIBR201701203).

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Received June 8, 2017
Revised June 26, 2017
Accepted June 26, 2017